

POSITION STATEMENT

Electrical Power Transmission

*Adopted by the IEEE-USA
Board of Directors (3 Jan. 2020)*

IEEE-USA calls on the U.S. government to take actions that will maintain and strengthen the U.S. electrical power transmission grid. A strong domestic transmission grid will:

- Maintain reliability and resilience for critical networks
- Support integration of conventional and large-scale renewable generation sources, as well as of energy storage systems
- Deliver power from renewable-rich sources to population centers
- Serve the needs of electrification efforts designed to reduce greenhouse gas emissions
- Meet interstate transmission needs, and accommodate systems and processes that operate across regulatory jurisdictions
- Assure cybersecurity of critical network components

Toward these goals, **IEEE-USA RECOMMENDS:**

- 1) Grid R&D:** Increase federal research and development for emerging technologies, modeling techniques, and decision/control processes that will improve the reliability, resilience, efficiency, and management of the power grid. Support development of requisite technologies to provide harmonious integration of renewable generation, storage systems, and distributed resources into the power grid and its operations.
- 2) Interconnection and Reliability Standards:** Increase federal support for working with IEEE and others, particularly NERC, on the development of standards for connecting to the transmission grid in a manner that strengthens the grid and preserves or improves system reliability and resilience.
- 3) Transmission Siting Processes:** Federal and state regulators should improve regional and interregional coordination efforts, to include both federal and state public policy goals in transmission routing and siting decisions.

- 4) **Cybersecurity:** Adopt practices recommended in the IEEE-USA Position Statement, [Cybersecurity](#), adopted by the Board of Directors 21 July 2019.

BACKGROUND

A robust electricity transmission system plays a critical role in enabling public policy objectives. It must support the integration of conventional and large-scale renewable generation sources along with demand response and energy storage; accommodate the retirement of older generation resources; facilitate market and operational efficiency for the benefit of consumers; and meet evolving national, regional and local reliability standards. The Federal Energy Regulatory Commission (FERC) and the North American Electric Reliability Corporation (NERC) play crucial roles in operating the transmission system and the wholesale electricity markets, while assuring reliability and security of the grid.

The transmission system is an interstate grid with the historical purpose of connecting generating resources with electrical load centers, e.g., cities, commercial and industrial facilities. A strong transmission grid provided the flexibility and robustness required to maintain reliability. Today, the grid continues to serve its original purpose, but a steady flow of new technologies and practices, which this grid was not designed to handle, is creating a plethora of heretofore-unforeseen challenges in maintaining reliability. These challenges are compounded by the retirements of many coal and nuclear plants. Further, the need to assure resilience has become more acute in view of increasing frequency and magnitude of natural disasters and intentional cyberattacks. The engineering, political, and regulatory challenge is to mobilize the resources to manage this revolutionary change for the benefit of all the stakeholders.

Increasing penetration of power electronic devices on the transmission system is creating new system dynamics and, with it, new operating regimes and challenges. Some of these devices are inverters that provide an interface between unconventional resources (particularly renewable generation and certain types of storage) and the grid. There is also a growing need and use for networked control of power grids for the sake of reliability, energy security, sustainability, and efficiency. Networked control devices may increase the vulnerability of the grid to cyberattacks and cyberattacks that have already occurred took advantage of known vulnerabilities and misconfigured operating systems, servers, and network devices. Advanced cyber defense, supply chain security, and mitigation systems for the energy grid must be built-in as part of grid design.

NERC has worked with IEEE to develop urgently needed standards, but additional technology R&D is required to develop “smarter” power electronics with new functionalities that enable these “inverter-based resources” to fully participate in providing essential reliability services for the grid. In addition, more effort is required to develop models capable of simulating the new dynamic electrical systems performance; assisting in establishing the value of various system components; and aiding in optimal sizing of the equipment.

Much of the renewable energy potential in the United States is located in areas that are remote from population centers and are not well connected to our national infrastructure for transmission of bulk electrical power. Better utilizing large renewable energy sources requires coordinated, long-term, regional planning and a fundamental reform of transmission line routing and siting approval processes. The current, splintered regulatory process can hold up construction of regional and interstate transmission and it presents an impediment to technological advances. All regulators should work together to overcome conflicts in the approval process for siting of regional and interstate transmission lines.

This statement was developed by the IEEE-USA Energy Policy Committee, and represents the considered judgment of a group of U.S. IEEE members with expertise in the subject field. IEEE-USA advances the public good, and promotes the careers and public policy interests of the nearly 180,000 engineering, computing and allied professionals who are U.S. members of the IEEE. The positions taken by IEEE-USA do not necessarily reflect the views of IEEE, or its other organizational units.